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ABSTRACT

Some comments are provided about challenges facing the "instructional theory community," and specific remarks are made about papers presented at a session on expectations about instructional theory at the 1998 annual meeting of the American Educational Research Association (AERA) (Session 2). An area of particular interest is that of instructional technology and the related challenges of using instructional theory to design instructional technology applications. Some ideas gained from conference presentations on instructional theory are discussed and some of the issues detected while reviewing papers on instructional theory are explored. The following presentations are reviewed: (1) "Designing Instruction for Meaningful Learning, Designing Instruction for Constructivist Learning" (Richard E. Mayer); (2) "Teaching and Learning for Understanding" (David M. Perkins and Chris Unger) (paper not actually presented at the AERA meeting); (3) "Cognitive Flexibility Theory as a Basis for Instructional Design: Technologies for Advanced Learning in Complex Domains" (Rand J. Spiro, Paul J. Feltovich, and Richard L. Coulson); (4) "Instructional Design Based on Knowledge Objects" (M. David Merrill); (5) "Self Science: Approach to Emotional Education" (Karen Stone); and (6) "The Elaboration Theory: Guidance for Scope and Sequence Decisions" (Charles M. Reigeluth). (SLD)

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Expectations about Instructional Theories and "Instructional Technology" Comments Regarding Six Instructional Theories

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Session #2: Expectations about instructional theories and "instructional technology." Comments Regarding Six Instructional Theories

(Theory papers, respectively, by Richard E. Mayer; Perkins & Unger; Rand J. Spiro, et al; M. David Merrill; Karen Stone; and Charles M. Reigeluth)

Glenn E. Snelbecker, Ph.D., Temple University

Paper presented at the American Educational Research Association Meeting in San Diego, CA, April, 1998

Note: Following are materials which were prepared for this paper. Some of the information about the respective theory papers was available prior to the session, while other observations and comments resulted from comments made by the respective authors as they presented their theory papers.

Some general, overlapping questions come to mind when reflecting on our current understanding about instruction. What is needed to stimulate research and to facilitate improved construction of instructional theories? What can be done to foster appropriate practical applications of this growing body of knowledge about instruction? What challenges exist and what tasks need to be addressed to help both knowledge-producers and knowledge-users benefit from, and contribute to, this growing body of knowledge about instruction? I've identified two sets of challenges and tasks for the "instructional theory community" that, hopefully, will benefit knowledge producers and knowledge users. For brevity I've summarily noted them as "taxonomy," and "technology" (or, more specifically, "instructional technology").

"Taxonomy"

Over the past several decades that I have been observing the development and use of psychotherapy theories. I've noted that, in the course of about twenty-five years there was an increase from thirty-six psychotherapy theories (Harper, 1959) to over four hundred theories (Karasu, 1986; Goldfried, Radin & Rachlin, 1997). In Chapter 2 of this Volume I briefly described some steps that have been taken by producers and users of psychotherapy theories to understand and cope with this proliferation of theories, including the formation of a Society for the Exploration of Psychotherapy Integration.

A brief examination of Volume 2 will indicate two dozen instructional theories. However, if one were to consider a few collections of theories that are not clearly identified here, the number of instructional theories that can be said to exist in the late 1990s would certainly exceed two dozen. For example, there is work in Europe and in other countries around the world that would add many more theories. If one were to include the various

collections of "teaching theories and models," even more theories that are relevant for instruction could readily be identified. Thus, even today one could readily identify far more than two dozen instructional theories. Given my own view that "technology" has a reciprocal relationship with instructional theory, it is not hard for me to image that we can expect that computers and the Internet may markedly increase the number of instructional theories we'll be reading within the next several years. Even if the total number of instructional theories does not grow at the geometric rate found with psychotherapy theories, it seems likely that in the not too distant future we will have dozens of instructional theories, possibly even hundreds of instructional theories to ponder.

The first set of challenges and tasks that I'll pose can be stated this way:

Challenge: How can we (knowledge producers and knowledge users) be aware of, understand and utilize this growing body of information about instruction?

Tasks: Explore prospects for developing a "taxonomy" that can serve as a system for classifying currently available theories and recognizing needs for further theory development. I suggest that our task will most likely be to develop some generally accepted taxonomy or other means for classifying instructional theories. At least at this point, I do not envision a need for forming something like a "Society for the Integration of Instructional Theories" (e.g., see Nathan's 1998 comments about psychotherapy practice guidelines).

Development of such a taxonomy could be quite useful but it will take a great deal of work and it most likely will have to be constructed by people representing the various constituencies interested in instructional theories. I'll suggest a few ideas here that might be useful in developing a taxonomy for instructional theories. There already exist a number of attempts to classify instructional theories or teaching models. In one of my earliest attempts at classification, I identified instructional theories in terms of the learning theories or other theories on which their instructional theories were based (Snelbecker, 1974/1985). In Volume 1 I classified theories in terms of the extent to which respective theories addressed certain aspects or facets of instruction (cf. Snelbecker, 1983, Table 12.1, page 456); that approach does not seem appropriate for considering Volume 2 theories. In Volume 1, the respective chapters by Gropper (1983) and by Landa (1983) represent two approaches to identifying what particular theories do and do not address. It is not yet clear, to me, as to whether those two approaches would be useful with Volume 2 theories. Another approach is illustrated by Gustafson and Branch's (1998) Survey of Instructional Development Models; however, it should be noted that this particular approach seems to focus on the development processes than on the nature of the instruction being designed.

There are other attempts to classify theories that are not as explicitly linked precisely to the words "instructional theories." For example, Joyce and Weil (1996) have identified "four families of models" as a way to classify teaching models. They group various approaches, respectively, into social, information-processing, personal, and behavioral systems families. Mosston and Ashworth (1990, page 3) present a "Spectrum of

Teaching Styles" based mainly on "the decisions that are made by the teacher and those that are made by the learner." Scriven's (1994) paper on "Duties of the Teacher" represents another set of ideas that might be used in developing a taxonomy of instructional theories. Scriven's "DOTT (duties of the teacher) list" is based on analyses of what teachers actually do. This includes one section on "Instructional Competence, but of course the DOTT list goes considerably beyond explicitly instructional duties. One might want to consider classifying instructional theories at least partly in terms of the kinds of learning outcomes on which they focus. If so, it might be useful to watch for an updated version of Bloom's widely-cited Taxonomy of Educational Objectives; a series of e-mail comments on AERA and European listservs indicate that a group has been working on a revised Taxonomy for the past few years.

"Technology" -- Especially "Instructional Technology"

Another challenge-task set stems from the reciprocal relationship between instructional theory and instructional technology – a relationship that offers both opportunities and obligations for the instructional theory community. As was the case with the first challenge-task set, this second topic has important implications for knowledge producers as well as knowledge users.

It is almost impossible not to be aware of the considerable extent to which the word "technology" often has been used when discussing instruction, education or training issues. However, not everyone defines the term the same way. That problems with the definition of technology, especially instructional technology, are not really new is reflected in the report, a quarter century ago, of an official U.S. Commission on Instructional Technology (cf. McMurrin, 1970; Tickton, 1970/1971). That Commission cautioned that it would be wrong to think of technology only as machines and "gadgetry," and that considering the various forms of media, hardware and software in isolation would not be adequate. They suggested "that a major obstacle to instructional technology's fulfillment has been its application by bits and pieces" (McMurrin, 1970, p. 20). They proposed that a broader approach "holds the key to the contribution technology can make to the advancement of education" (McMurrin, 1970, p. 19). They proposed this definition of instructional technology. "It is a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and non-human resources to bring about more effective instruction (McMurrin, 1970, pp. 5 and 19).

With this broader definition, "instructional theory" is an important, integral part of "instructional technology." But even if one elects to use a narrower definition for "technology," there is a close reciprocal relationship between instructional technology and instructional theory. Good learning experiences involving technology can best be based on a sound instructional theory for several reasons. For example, an instructional theory can help us to think about instruction in an organized way; instructional theory can help "inform" us about what is likely to happen, and why it might happen, with different kinds of teaching-learning activities, and can

help indicate appropriate ways to evaluate the implementation and impact of instructional technology resources. Conversely, these practical applications of instructional theory provide important opportunities for knowledge producers to "test" instructional theories, to identify needed modifications in our conceptualizations about instruction, and can generally foster development of better instructional theories. (For more extensive discussions about theory-technology and theory-practice issues than is possible here, readers may want to review comments by Seels (1997) and by Salisbury (1988), along with additional papers, respectively, in the 1997 and 1988 journal issues where those two papers were published.)

This reciprocal relationship was evident early in the development of instructional theories. For example, certain aspects of behavior modification theory emerged directly in conjunction with teaching machines and programmed instruction. (Although those forms of instructional technology may seem limited by today's standards, they represented state-of-the-art types of technology in the late 1950s and 1960s; some of the more complicated teaching machines cost many thousands of 1960s dollars.) Other instructional theories subsequently originated in, and drew support from, computer-based instruction; in some cases the instructional theories were developed in parallel with the development of courseware and even some hardware. Thus, it is important for us to consider and prepare for the extent to which burgeoning uses of instructional technology may both place a burden on and help further develop instructional theory. Other more recent indications of a reciprocal relationship between instructional technology and instructional theory can be detected by observing contemporary instructional applications of computers, multimedia systems, the Internet, and other emergent technology resources.

A close relationship between instructional technology and instructional theory may be detected in a series of discussions over the past few decades concerning the extent, if any, to which some form of technology (television, computers, multimedia systems, the Internet, etc.) can facilitate learning. Many discussions since the middle1980s have been stimulated by and/or have made reference to a 1983 Review of Educational Research paper by Richard Clark, "Reconsidering Research on Learning from Media." In that paper and in a series of other subsequent papers (e.g., Clark, 1992 & 1994), Clark has taken and maintained the position that technology as a delivery system really should not be expected to have any meaningful impact on instruction. In brief, as I understand his position, Clark contends that it is what we do with the delivery system – the instructional methods used, the ways that the instruction is designed – that will influence learning. Other authors have raised questions about the extent to which we should opt for technology applications to instruction – even though they envision potentially positive benefits of some such applications. For example, in a context of great enthusiasm and financial support for web-based activities, Windschitl (1998) expressed concern because we presently lack evidence as to whether (and, if it does, how) use of the Internet actually influences students' learning. He acknowledged Clark's (1994) skepticism about whether the medium, per se, would influence learning, but he also proposed that researchers become more involved in investigating possible process and outcome impact of such technology that is designed to support learning. Van Horn (1998, p. 556) has suggested that the "instructional design used to structure

tomorrow's schools will be unlike today's designs." Van Horn did not specify, in this article, whether he agrees or disagrees with Clark's position. However, his emphasis on using the interactivity afforded by technology capabilities lends support to the view that whether technology will influence learning will quite likely depend on the kinds of teaching-learning activities that we design with the technology.

Here is the second challenge and task set:

- Challenge: How to use instructional theory to design instructional technology applications constructively, and how to use instructional technology applications to foster further development of instructional theory?
- Tasks: Identify ways to help ensure that "curriculum and instruction drive technology" instead of having "technology drive curriculum and instruction." Indicate how instructional theories can aid instructors in deciding when/where/how to use technology resources; also indicate limitations of instructional theories in doing this. Candidly identify changes/improvements/modifications needed in instructional theories, and indicate what other theories and models may be required along with instructional theories. Consider whether "development" models and approaches need to be identified separately from instructional theories, or indicate ways to decide which instructional theory can be selected. Find means whereby technology applications may provide a basis for testing and modifying instructional theory. Just as instructional practices may need to be modified in light of ideas from theories, consider what changes are needed in the instructional theories in light of their uses with technology-supported instruction.

As I have done in the previous session, now I will briefly identify (a) some ideas that I gained from the respective theories, and (b) some issues detected while reading a particular theory but which are relevant for instructional theories more generally.

Presentation #1, Session #2

Chapter 8 Richard E. Mayer, Designing Instruction for Meaningful Learning [Designing Instruction for Constructivist Learning]

"Ideas":

- The author identifies "three views of learning and instruction" as: "learning as response strengthening, learning as knowledge acquisition, and learning as knowledge construction." While identifying the approach addressed here as "the knowledge construction view," he does not seem to indicate how, if at all, he considers the other two approaches to be relevant today.
- An interesting array of foundation ideas are presented, along with suggested methods for facilitating constructive processes and outcomes.

"Issues":

- To the extent that it is proposed that the "knowledge as construction view" can guide all aspects of instruction, I must remain skeptical.
  - My review of research as well as my observations in practical settings suggest to me that some other forms of learning processes and methods, including "rote learning" and other "lower level" forms of learning, will continue to be a part of instructional processes and outcomes which we must address ... as researchers as well as practitioners.
- While contending that "constructivist learning is active learning" (p. 2), it is not clear whether the author is contending that "other views" do not constitute active learning.
  - I suspect that a number of other theorists might take issue with such a stand – if that is the author's intention.
- Another potential problem may be indicated by this statement: "Robins and Mayer (1993) have shown how constructivist learning depends on the learner's cognitive activity rather than the learner's behavioral activity. It follow that instructional design should seek to encourage the learner to be cognitively active rather than solely to focus on promoting behavioral activity.
  - Many years ago I had the privilege of talking about such matters with Robert B. MacLeod, a psychologist who was quite "learned" about phenomenological psychology, including empirical and philosophical foundations. He made the observation that "we are all behaviorists to some extent." He then made a distinction between those psychologists who develop their conceptualizations on the basis of behavior they observe versus those who draw inferences from behaviors they observe.
  - Unless science of detection has reached the point where we can "look into" the cognitive operations directly, I suspect that we still are dependent on behavioral observations ... at least to some degree ... in concluding how and whether our learners are "cognitively active."

Notes were prepared on the basis of Perkins and Unger's Chapter 5 draft, but their paper was NOT presented at AERA.

Chapter 5, David M. Perkins and Chris Unger, Teaching and Learning for Understanding

"Ideas":

- Fritz Heider, a major figure in the emergence of modern social psychology and a long-time student of "common sense psychology" – the "psychology 'theory' that each person displays – would, in my opinion, be very supportive of some comments in this chapter. I particularly refer to those observations that are based on "what people tell us about themselves."
  - Heider typically would first identify the informal principles that seemed to guide a person's behavior, and then he would "test" those principles to detect the extent to which they would receive empirical support.
- The authors apparently have gone back and forth, formulating theory evolving theory and testing it in various ways.

- They also indicate that they have recognized some limitations in the applicability or relevance of their "understanding" theory.
  - For example, on page 4 of their chapter manuscript they state: "None of this means that understanding is a universal educational value dominant over other considerations in all circumstances. For some kinds of learning, understanding may be less of a central concern."
- Also, later in their chapter (starting on page 7 of their chapter manuscript) they include a section entitled: "Comparison and Contrast with Other Views."
- Moreover, they try to help readers "understand" (I chose this word carefully!) how their particular constructivist approach is similar to and different from other constructivist approaches. This seems to be valuable both for clarifying the nature of their approach and for demonstrating via their own writing how they are trying to facilitate "understanding" for their readers.

• This paper has some ideas that may be useful in indicating ways to use "SOI" (Selecting, Organizing, Integrating) strategies.

"Issues":

- Perhaps I missed some key points, but there are at least two issues that apparently need consideration here:
  - Does the "fact" that someone 'understands something' mean that they will be able to apply it?
  - Does the "fact" that someone does not do something necessarily mean that that person's problem lies in their lack of understanding?
- Although time and space (here, and in their chapter) do not really permit these authors to provide comprehensive details, it would be helpful for other researchers and theorists, as well as for practitioners, to have more guidelines about integrating the "understanding" approach with other learning activities and processes.

Presentation #2, Session #2

- Chapter 6 Rand J. Spiro, Paul J. Feltovich, & Richard L. Coulson, Cognitive Flexibility Theory as a Basis for Instructional Design: Technologies for Advanced Learning in Complex Domains

"Ideas":

- Makes the case that constructivist approaches and situated cognition approaches can and should incorporate concept and knowledge structures – that have been emphasized in earlier theories and research, and sometimes (often?) seem to be ignored or refuted by some current cognitive approaches

• This paper contains ideas that might be depicted as "instructional design for ill structured and/or less structured and less complex domains.

- Offers some ideas that may be applicable to hypermedia-linked instruction – at "beginner" levels as well as at " more advanced" levels
- Somewhat reminiscent of Bruner's often quote and somewhat controversial view that we can teach widely ranging students ideas about topics in an intellectually honest way, so long as we take into account their developmental levels and readiness to handle less or more complex facets of topics being addressed

"Issues":

- How to know when to be flexible, for how long, for one or all learners?
- How to teach novices to develop repertoires and "flexible and adaptive" strategies and methods? To individuals, and/or to teams?
- These issues not only are relevant for instructional design teams but also especially for individual instructors who are trying to incorporate Internet resources and other technology resources

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Presentation #3, Session #2

Chapter 18 M. David Merrill, CDT2: Instructional Design Based on Knowledge Objects (Instructional Transaction Theory (ITT): Instructional Design Based on Knowledge Objects)

"Ideas":

- The focus and the contents of this theory contrast rather sharply with other theories in the group that focus to a great extent on learner's cognitive constructions. For example ... some features of this theory --
- p. 1: "Component Display Theory (CDT) provides a list of prescriptions for designing instruction for different kinds of instructional outcomes.
- Distinguishes between curriculum ("what to teach") and instruction ("how to teach") to a greater extent than is the case with some other instructional theories.
- Focuses on instructional aspects, and identifies selection and representation as two considerations regarding "how to teach."
- p. 2: ITT (Instructional Transaction Theory) "is an algorithmic instructional system."

- The key ideas in this theory include identifying alternative instructional methods and selecting ways in which designated curricular goals are likely to be addressed effectively, while also attempting to maintain some degree of adaptability and flexibility regarding the instruction.
- The system is designed to recognize patterns displayed by learners through monitoring of each learner's interactions with the instructional system along with an architecture and algorithms to "interpret" the significance of selected learner response patterns.

- What I found particularly interesting was the extent to which this theory had to be made so explicit that it could be organized for the software aspects.
- That alone means that the theory not only can be better understood but also that it is more easily subjected to critical examination (as compared with a theory that is not so explicitly described).

"Issues":

- Critics could question whether there is too much structure built into the instruction provided, and whether this approach would be appropriate for higher levels of cognitive processes and outcomes.
- Also, because the theory provides rather explicit designations of much of the presentation features and rationale, some critics may suggest that this kind of approach "may be appropriate for 'training' contexts but not for 'education' contexts or for training of problem finding and problem solving outcomes.
- Others might question whether learning experiences with this kind of approach may "make" the learner be too dependent on structure provided by someone or something else (i.e., not by the learner).
- As with the group-oriented approaches and the "constructivist" approaches, readers could benefit from guidelines about how to integrate this kind of approach with other forms of instruction.

- However, it is very important to recognize that there are risks for any and all theories that become "mature" enough to have been presented in detail. I believe, for example, that it is only a matter of time until similar "problems" will be identified with social constructivist theories. It seems inevitable that as soon as we can articulate the characteristics of changes and can identify probable influences, some critics will accuse such a mature theory as being "mechanistic." One need only review histories about development of theories to find instances in which this has occurred.
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Presentation #4, Session #2
Chapter 23 Karen Stone, Self Science: Approach to Emotional Education {Self Science: Emotional Intelligence for Children)
(Listed on Chapter 23 as (Karen Stone-McCown & Ann Hathaway McCormick)

"Ideas":

- Based on their conviction about the merits of an "emotional intelligence," these authors describe a 25-year-old (and still growing/changing) series of experiences in meeting with small groups of children, once or twice a week, in "Self-Science: The Subject is Me."
- The purpose is "to equip children with affective and cognitive skills that broaden their understanding and functioning in all learning and social situations.

- Numerous examples were described, and a general rationale for the approach was articulated.
- Apparently these authors may have based their work at least partly on (Harvard Psychologist) Daniel Goleman's concept of "emotional intelligence

"Issues":

- One of my thoughts as I read this chapter was partly evoked when the author(s) referred to previous work on self-esteem: How does this approach compare with and contrast with previous self-esteem interventions, interventions that have had, at best, mixed results?
- This, in turn, furthered my curiosity about the extent, if any, which the "Self-Science" curriculum might encounter problems similar to those of self-esteem development advocates. In particular I wondered about the extent to which these matters can be addressed as a somewhat separate matter versus incorporating development of more positive attitudes in conjunction with "academic" successes. No simple answers here, just some questions.
- On the other hand, I also had questions in the event that these kinds of programs might be successful.
- From that perspective, in many respects, my reactions to this paper on "Self Science: An Approach to Emotional Education" are similar to my reactions to the paper/chapter by Kamradt and Kamradt, as follows:
- Some "issues" (already noted regarding the Kamradt and Kamradt paper) which are relevant for instructional theory more generally.
- When and how should we acknowledge that "attitudes" are sufficiently important as outcomes that we may (a) identify attitudinal change or development as an explicit goal, (b) designate instructional strategies to change or develop attitudes, and (c) "count" attitudinal change or development as a major basis on which to evaluate learners' "achievement" and program's effectivness?
- However we deal with these and related questions, we need to recognize and to understand how feelings, emotions and attitudes influences various facets of learning and instruction.

Presentation #5, Session #2

- Chapter 19 Charles M. Reigeluth, The Elaboration Theory: Guidance for Scope and Sequence Decisions
- This theory then gives us general views and some guidelines so that we can, more often than not, see that sequencing makes a "positive" difference.
- One of the most useful ideas from this theory can be depicted as follows: "The issue, as with most instructional strategies, is not whether it [sequencing] makes a difference, but when it makes a differences and when it doesn't" (page 3 of chapter manuscript).
- Sequencing guidelines in this theory are based on or "informed by" information from research and theory, including but not limited to "expert versus novice" studies.

- Raises a number of issues concerning the place and the extent to which we "should" use almost any kind of strategy or technique for planning and/or providing instruction. When we should we use which strategy, with which learners, for what subject matter, for how long, and with what kind(s) of approach to follow or to precede any particular intervention?

"Issues":

Some "issues" that are prompted by this theory .... but by no means are limited to this theory .... include questions about how we can "handle" the diverse sequencing strategies and guidelines that conceivably may be identified. This matter can partly be addressed via the suggestions included here about when to use particular kinds of approaches, but I can almost hear now the comments by students and experienced people alike, concerning "how to know what to use what with whom?"

- Also stimulated by this paper are various issues concerning the time and extent to which the learner should know about and be able to control sequencing decisions and be able to have an active role regarding decisions about use of any given intervention.